

CLAIMS

1. A chemical analytic apparatus which performs various kinds of processing for analyzing a very small amount of droplet chemically, including:

in a condition where magnetic ultrafine particles are mixed to a droplet,

a conveyance means by which the droplet to which said magnetic ultrafine particles were mixed is conveyed in another liquid, for processing of chemical analysis, by applying magnetic field to said magnetic ultrafine particles.

2. The chemical analytic apparatus according to claim 1, including:

a processing means by which operations for processing of chemical analysis are performed one by one in the process in which the droplet to which said magnetic ultrafine particles were mixed is conveyed by said conveyance means.

3. The chemical analytic apparatus according to claim 2, wherein

plural kinds of the droplets to which said magnetic ultrafine particles are mixed and of only the droplets are provided, and said processing means includes small compartments separated by plural bulkheads, and said plural kinds of droplets to which said magnetic ultrafine particles were mixed or only the droplets are arranged in

each said small compartment, and

an droplet to which said magnetic ultrafine particles are mixed and which is arranged in an optional small compartment is conveyed by said conveyance means, by passing through each bulkhead provided in each said small compartment, and a chemical reactive operation itself or part of the operation is performed by uniting it with the other droplet out of said plural kinds arranged in the other small compartments.

4. The chemical analytic apparatus according to claim 3, wherein

when an optional droplet out of said plural kinds to which said magnetic ultrafine particles are mixed and which is arranged in an optional small compartment is conveyed to said other small compartment by said conveyance means by passing through each bulkhead provided in each said small compartment,

the optional droplet out of said plural kinds to which said magnetic ultrafine particles are mixed is separated to the droplet that includes said magnetic ultrafine particles and the droplet that does not include said magnetic ultrafine particles, by using physical and chemical characteristics such as wettability and surface tension of said droplet.

5. The chemical analytic apparatus according to claim 1, 2, 3 or 4, wherein

by controlling the magnetic field which is externally applied to the droplet to which said magnetic ultrafine particles are mixed, said magnetic ultrafine particles are dispersed and cohered in the inside of the droplet, and also the operation of the droplet to which said magnetic ultrafine particles is performed.

6. The chemical analytic apparatus according to claim 5, wherein

other than the control of said external magnetic field, the physical and chemical reaction control by at least light, heat or pH is used.

7. The chemical analytic apparatus according to claim 1, 2, 3 or 4, wherein

in the condition where a specimen for performing chemical reactive operation adhered to surfaces of said magnetic ultrafine particles, said magnetic ultrafine particles are used as a carrier to perform the chemical reactive operation to said specimen.

8. The chemical analytic apparatus according to claim 2, 3 or 4, wherein

by combining a plurality of said small compartments which are separated by plural bulkheads and which become said processing means, a series of chemical reactive operation by at least reaction, separation and dilution to a specimen that adhered to surfaces of

said magnetic ultrafine particles is performed.

9. A chemical analytic apparatus which performs various kinds of processing for analyzing a very small amount of droplet chemically, including:

in a condition where magnetic ultrafine particles are mixed to a droplet,

a conveyance step by which the droplet to which said magnetic ultrafine particles were mixed is conveyed in another liquid, for processing of the chemical analysis, by applying magnetic field to said magnetic ultrafine particles.

10. The chemical analytic apparatus according to claim 9, including:

processing steps by which operations for processing of chemical analysis are performed one by one in the process in which the droplet to which said magnetic ultrafine particles were mixed is conveyed by said conveyance step.

11. The chemical analytic apparatus according to claim 10, wherein

plural kinds of the droplets to which said magnetic ultrafine particles are mixed and of only the droplets are provided, and the processing conditions by said processing steps are formed in small compartments separated by plural bulkheads, and said magnetic

ultrafine particles of the plural kinds are arranged in each said small compartment, and

an optional droplet out of said plural kinds of droplets to which said magnetic ultrafine particles were mixed and which is arranged in an optional small compartment is conveyed by said conveyance means by passing through each bulkhead provided in each said small compartment, and a chemical reactive operation itself or part of the operation is performed by uniting it with the other droplet out of said plural kinds arranged in the other small compartments.

12. The chemical analytic apparatus according to claim 11, wherein

when the optional droplet out of said plural kinds to which said magnetic ultrafine particles are mixed and which is arranged in the optional small compartment is conveyed to said other small compartment by said conveyance step by passing through each bulkhead provided in each said small compartment,

the optional droplet out of said plural kinds to which said magnetic ultrafine particles are mixed is separated to the droplet that includes said magnetic ultrafine particles and the droplet that does not include said magnetic ultrafine particles, by using physical and chemical characteristics such as wettability and surface tension of said droplet.

13. The chemical analytic apparatus according to claim 9, 10,

11 or 12, wherein

by controlling the magnetic field which is externally applied to the droplet to which said magnetic ultrafine particles are mixed, said magnetic ultrafine particles are dispersed and cohered in the inside of the droplet, and also the operation of a specimen that adhered to surfaces of said magnetic ultrafine particles is performed.

14. The chemical analytic apparatus according to claim 13, wherein

other than the control of said external magnetic field, the physical and chemical reaction control by at least light, heat or pH is used.

15. The chemical analytic apparatus according to claim 9, 10, 11 or 12, wherein

in the condition where a specimen for performing chemical reactive operation adhered to surfaces of said magnetic ultrafine particles, said magnetic ultrafine particles are used as a carrier to perform the chemical reactive operation to said specimen.

16. The chemical analytic apparatus according to claim 10, 11 or 12, wherein

by combining a plurality of said small compartments which are separated by plural bulkheads and which form the processing

conditions by said processing steps, a series of chemical reactive operation by at least reaction, separation and dilution to the specimen that adhered to surfaces of said magnetic ultrafine particles is performed.